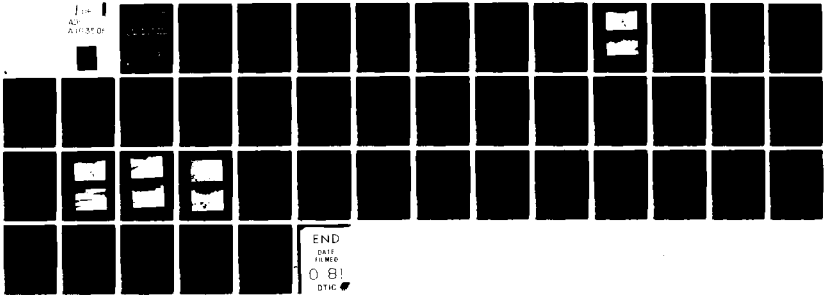
AD-A103 505 ARMY ENGINEER DISTRICT NORFOLK VA F/G 13/13
NATIONAL DAM SAFETY PROGRAM. SPRING VALLEY LAKE DAM (INVENTORY --ETC(U)
NOV 80 J A WALSH

UNCLASSIFIED NL



ROANOKE RIVER BASIN

LEVEL II

Name Of Dam: SPRING VALLEY LAKE
Location: CITY OF ROANOKE, VIRGINIA
Inventory Number: VA 77002

PHASE I INSPECTION REPORT
NATIONAL DAM SAFTY PROGRAM

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

NOVEMBER 1980

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A103	3. RECIPIENT'S CATALOG NUMBER 505
4. TITLE *(and Subtitle)* Phase I Inspection Report National Dam Safety Program		5. TYPE OF REPORT & PERIOD COVERED Final
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineering District 803 Front Street Norfolk, Virginia 23510		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE November 1980
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Dams - VA
National Dam Safety Program Phase I
Dam Safety
Dam Inspection

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to indentify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

ROANOKE RIVER BASIN

NAME OF DAM: SPRING VALLEY LAKE DAM
LOCATION: CITY OF ROANOKE, VIRGINIA
INVENTORY NUMBER: 77002

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

TABLE OF CONTENTS

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam:	Spring Valley Lake Dam
State:	Virginia
Location:	City of Roanoke
USGS Quad Sheet:	Salem
Stream:	Tributary of Barnhardt Creek
Date of Inspection:	13 November 1980

The Spring Valley Lake Dam is an earthfill structure about 450 feet long and 23.9 feet high with a private paved roadway traversing the entire dam. The dam is owned and maintained by Spring Valley Lake Homeowners Association. The dam is classified as a small size with a significant hazard classification. The principal spillway is an 8-inch cast iron pipe drop-inlet that passes through the dam at low level. The secondary spillway is three 36-inch corrugated metal pipes at the right abutment. The emergency spillway is an open channel cut at the left abutment which is also a low point in the private paved road. The reservoir is used for recreation.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 1/2 PMF. The spillways will pass 29 percent of the PMF or 58 percent of the SDF without overtopping the crest of the dam. The SDF will overtop the dam by a maximum 0.25 feet, reach an average critical velocity of 3.4 feet per second and flow over the dam for 1 hour. Flows overtopping the dam during the SDF are not considered detrimental to the embankment. The spillways are adjudged inadequate but not seriously inadequate.

The visual inspection revealed no apparent problems and there are no immediate needs for remedial measures. A stability check is not required. Maintenance is performed by the owners. However, there is no regular maintenance operations program or warning system. It is recommended that a regular maintenance and operations program be instituted with provisions for

accurate records of all maintenance performed. It is also recommended that a warning system be established and that the maintenance items listed in Section 7.2 be accomplished as part of the regular maintenance program within the next 12 months.

Submitted By:

Original signed by
JAMES A. WALSH

JAMES A. WALSH, P. E.
Chief, Design Branch

Approved:

Original signed by:
LTC Lawrence C. Connor

DOUGLAS L. HALLER
Colonel Corps of Engineers
District Engineer

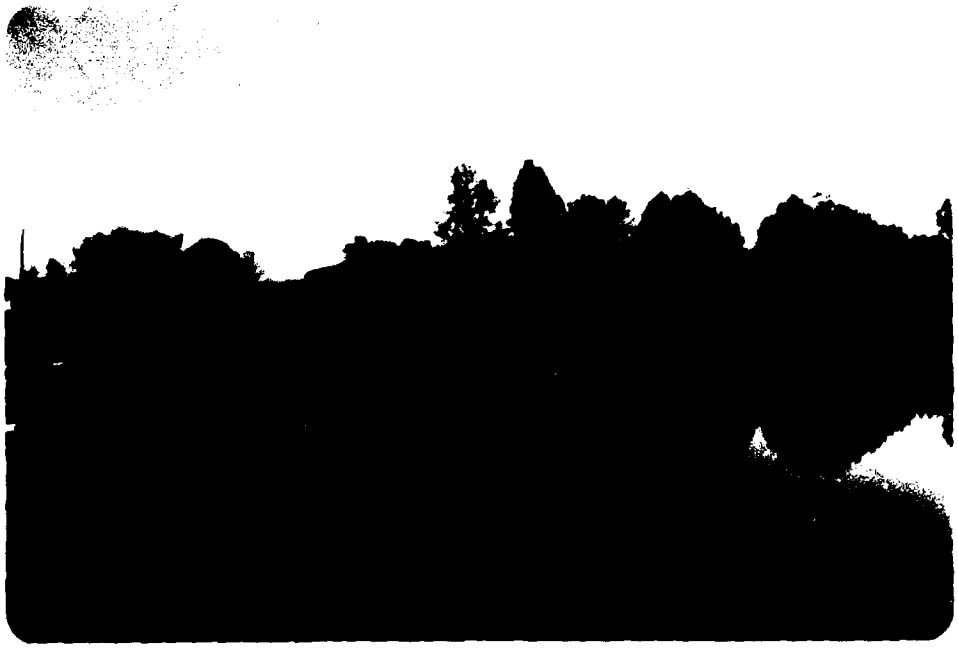
Recommended By

Original signed by
JACK G. STARR

JACK G. STARR
Chief, Engineering Division

Date: FEB 12 1981

CREST



OVERALL VIEWS OF SPRING VALLEY LAKE DAM

13 NOVEMBER 1980

SECTION 1

PROJECT INFORMATION

1.1 GENERAL:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 1, Appendix V). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Spring Valley Lake is an earthfill embankment about 450 feet long and 23.9 feet high. The crest of the dam is 24 feet wide and traversed by a paved private roadway with the low point across the dam at elevation 1045.0 feet m.s.l. The upstream slope is 2 horizontal to 1 vertical (2H:1V) above the waterline and calculated 2.7H:1V below the waterline. A two foot high retaining wall protects the upstream slope. The downstream slope is 3.5H:1V.

The contractor stated that the embankment cutoff was keyed into hard shale. The left abutment was keyed into overburden. There are no foundation drains.

The principal spillway is an 8-inch cast iron drop-inlet pipe located about 40 feet into the reservoir. The crest of the drop-inlet is at elevation 1040.2. The 8-inch cast iron pipe passes through the dam at low level and discharges at the toe of the dam. Placed ri-rap at the outlet reduces velocities discharging the outlet.

The secondary spillway is comprised of three 36-inch corrugated metal pipes located at the right abutment. The invert elevation of the upstream end of the pipe is 1041.4 and the downstream is 1041.2.

The emergency spillway is an open channel cut at the left abutment. The width of the emergency spillway is about 75 feet with a minimum crest elevation of 1043.2.

The reservoir can be drained to about elevation 1032.2 as explained in Appendix IV.

1.2.2 Location: Spring Valley Lake Dam is located in the City of Roanoke, Virginia about 0.5 miles southwest of the intersection of U. S. Route 11 and State Route 684.

1.2.3 Size Classification: The dam is classified as small in size based on the criteria in Reference 1 of Appendix V.

1.2.4 Hazard Classification: The Spring Valley Lake Dam is located in a residential area upstream of several homes. Therefore, a significant hazard classification is given for this structure according to guidelines contained in Section 2.1.2 of Reference 1 of Appendix V. The hazard classification used to categorize dams is a function of location only and has nothing to do with their stability or probability of failure.

1.2.5 Ownership: Spring Valley Lake Homeowners Association.

1.2.6 Purpose: Recreation.

1.2.7 Design and Construction History: The dam was constructed in 1950 by Robert T. Main of Roanoke, Virginia. The dam was reported to be designed and constructed under the supervision of the Soil Conservation Service (SCS).

1.2.8 Normal Operational Procedures: Water passes automatically through the spillways when the reservoir reaches the crest elevations.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of 0.26 square miles, 0.11 square miles below Windsor Lake Dam (VA I.D. No. 77001).

1.3.2 Discharge at Dam Site: Maximum flood - flow through the emergency spillway has been noted at least twice.

Pool level at crest of dam

Secondary Spillway . . . . . 62 cfs
Emergency Spillway . . . . . 598 cfs

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet msl	Reservoir Capacity Area, acres	Acre, feet	Watershed, inches *	Length feet
Crest of Dam	1045.0	8.2	80	13.6	1175
Emergency Spillway Crest	1043.2	7.7	70	11.9	1135
Secondary Spillway Invert	1041.4	7.0	60	10.2	1105
Principal Spillway Crest	1040.2	6.4	48	8.2	1075
Streambed at Downstream Toe of Dam	1021.1	--	--	--	--

*Based on a drainage area of 0.11 square miles.

SECTION 2

ENGINEERING DATA

2.1 Design: There is no known design information.

2.2 Construction: There are no known construction records. However, Mr. Robert T. Main, the contractor was present during the inspection. According to Mr. Main, the dam was designed and constructed under the supervision of the Soil Conservation Service (SCS).

The original site conditions were soft. Unsatisfactory overburden was removed and an embankment cutoff was keyed into foundation materials. On the right abutment, the cutoff was keyed into hard shale. The left abutment was keyed into satisfactory overburden. The cutoff consisted of clay. The embankment proper was constructed of clay with shale fragments. Borrow material was excavated from within the reservoir area. Three D-8 dozers, one 18 yard scraper and a sheepsfoot roller were used to construct the dam. The fill material was placed in 4-inch lifts by the scraper and compacted by a D-8 dozer pulling the sheepsfoot roller.

The dam was constructed without a foundation drain. A portion of the principal spillway pipe was laid on a gravel bed. Mr Main could not recall specific details. The gravel was probably placed under the pipe downstream of the cutoff.

2.3 Evaluation: There is insufficient information to evaluate foundation and embankment stability.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

3.1.1 General: The results of the 13 November 1980 inspection are recorded in Appendix III. At the time of the inspection, the weather was clear and cool. The temperature was 50-55°F. and the ground conditions were dry. The pool elevation was 1039.8 feet msl or about 0.4 feet below normal pool elevation. There was no tailwater. The reservoir was too low to pass through the principal and secondary spillways. There are no prior inspection reports.

3.1.2 Embankment: The embankment is in good condition. Sketches showing a plan view, crest profile and cross section are provided on Plate II and III, Appendix I. An overall view of the crest is provided at the beginning of the report and in Photo. No. 1, Appendix II.

There are no signs of surface cracks, unusual movement, or misalignment. The crest serves as a private road. It is paved with bituminous asphalt. There is no riprap. The upstream slope is protected by a two foot high retaining wall. The wall showed no signs of movement.

There is a shallow slough on the upstream slope in line with the principal spillway. The slough is old and vegetated. It is 17 feet wide. It extends from the top of the retaining wall to one foot below the crest. The wall shows no signs of movement. There are no other signs of erosion other than a second animal borrow on the upstream slope just below the speed bump. The upstream slope is shown in Photo. No. 2, Appendix II.

No seepage was found. There is a soft muddy spot located just left of the gated outlet. There is no explanation for the wet spot. A second and much larger wet spot is located about 100 feet downstream. It is suspected this spot is actually a sanitary drain field. The downstream slope with the large wet spot in the foreground is shown in Photo. No. 4, Appendix II.

The upstream slope is covered with trimmed grass. Also, there are three trees and some brush on the slope as located on Plate II, Appendix I. The downstream slope is sparsely vegetated with grass. Portions of the slope are vegetated with bushes, saplings, and trees as shown in Photo. No. 3, Appendix II. The immediate downstream area is a fenced horse pasture area and the animals graze on the downstream slope.

3.1.3 Outlet Works: The 8-inch cast iron drop-inlet pipe to the principal spillway is in good condition. The wheel and stem gate located at the outlet is also in good condition as shown in Photo. No. 5, Appendix II. The valve is left open.

The three 36-inch corrugated metal pipe (CMP) secondary spillway is in good condition. The entrance is blocked by shrubs. An earth berm partially blocks the discharge end.

3.1.4 Emergency Spillway: The spillway is a low point in the road at the left abutment. The approach channel is grassed with a mild slope. The discharge channel is grassed with a steep slope along the left abutment.

3.1.5 Instrumentation: There is no instrumentation on the dam.

3.1.6 Reservoir Area: Residential homes surround the reservoir as shown in the over all view at the beginning of the report. Area slopes are mild. There are no signs of erosion or slope failures. The lake was partially dredged about 20 years ago and little sedimentation was removed. Present conditions are unknown.

3.1.7 Downstream Channel: The downstream channel is shallow and narrow with a wide, flat flood plain as shown in Photo. No. 6, Appendix II. Several homes are located in the downstream flood plain.

3.2 Evaluation: Overall the dam appears to be in good condtion. However, there is no apparent explanation for the slough that is in line with the principal spillway. The slough is inactive but is in combination with the soft wet spot just left of the gated spillway outlet. This condition indicates a possible erosion problem along the spillway pipe. The crest and downstream slope showed no signs of settlement or sloughing. There were no signs of erosion around the outlet pipe. Shortly after the official inspection, the reservoir was drawn down. On 30 November 1980, the exposed upstream slope was casually observed for further sloughing. There were no signs of additional sloughing. Since there were no active signs of erosion, it is concluded there is no need for immediate remedial action, but periodic monitoring should be instituted.

In addition to the above problem, the visual inspection revealed the need for preventive maintenance. Hence, these items plus monitoring of the slough should be scheduled as part of an annaul maintenace program. These are:

a. The slough on the upstream slope and the wet spot just left of the principal spillway outlet should be monitored. If the slough enlarges, and/or erosion develops along the outlet pipe, the reservoir should be immediately drawn down and a professional geotechnical engineering firm should be contacted for further evaluation.

b. All shrubs and trees up to 3 inches in diameter should be cut to the ground. Trees greater than 3 inches should have there root systems removed. Subsequent holes should be backfilled with compacted material and seeded.

c. The shrubs that block the entrance to the three 36-inch CMP should be cut to the ground. The berm that blocks the discharge invert of the three CMP should be cut down to below the invert.

d. The sparsely vegetated downstream slope should be reseeded and animals prevented from grazing on it to protect the growth on the slope.

e. The animal burrows on the upstream slope should be backfilled and seeded.

f. A staffgage should be placed in the reservoir area to visually monitor pool elevations.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool is elevation 1040.2 ft msl, which is the crest of the principal spillway drop-inlet. The reservoir provides private recreation. Water passes automatically through the principal spillway when the reservoir rises above elevation 1040.2. Water will pass through the secondary spillay and emergency spillway when the reservoir rises above the spillways crests, 1041.4 and 1043.2, respectively. The reservoir can be lowered to elevation 1032.2 as explained in Appendix IV.

4.2 Maintenance: Maintenance is performed as needed by residents of the Homeowners Association of Spring Valley Lake. Grass on the embankment is cut, animal burrows filled with concrete and algae controlled as a part of the maintenance program. Maintenance work is recorded and passed to the person responsible for the dam.

4.3 Warning System: At the present time, there is no warning system or evacuation plan for Spring Valley Lake Dam.

4.4 Evaluation: The dam does not require an elaborate operational and maintenance procedure. However, a regular maintenance program should be initiated and documented to help detect and correct problems as they occur. An emergency operation and warning plan should be developed. It is recommended that a formal emergency procedure be prepared and furnished to all operating personnel. This should include:

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area is necessary.

SECTION 5

HYDRAULIC/HYDROLOGIC DATA

5.1 Design: None were available.

5.2 Hydrologic Records: None were available.

5.3 Flood Experience: Flows through the emergency spillway have occurred at least twice.

5.4 Flood Potential: The 100 Year Flood, 1/2 PMF, and PMF were developed and routed through the reservoir by use of the HEC-1DB computer program (Reference 2, Appendix V) and appropriate unit hydrograph, precipitation and storage-outflow data. Clark's Tc and R coefficient for the local drainage area were estimated from basin characteristics. The rainfall applied to the developed unit hydrograph was obtained from the U. S. Weather Bureau Publications (References 3 and 4, Appendix V).

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1.

Water passes automatically through the dam as the reservoir rises above crests of the spillways.

The storage curve was developed based on areas obtained from a U. S. Geological Survey Quadrangle Map. Survey data taken during the inspection was correlated to the Salem, Virginia Quadrangle Map to help develop area-storage data. Rating curves for the principal spillway, secondary spillway, emergency spillway, and non-overflow section were developed. In routing hydrographs through the reservoir, it was assumed that the initial pool level was at the principal spillway crest (elevation 1040.2).

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance is shown in the following table:

Table 5.1 RESERVOIR PERFORMANCE

Item	Normal Flow	100 Year Flood 1/	1/2 PMF	PMF 2/
Peak flow c.f.s.				
Inflow	1	278	1254	2619
Outflow	1	121	1254	2557
Maximum elevation ft. msl	1040.2	1043.42	1045.25	1045.80
Non-overflow section (el 1045.0)				
Depth of flow, ft	-	-	0.25	0.8
Duration, hrs	-	-	1.0	2.0
Velocity, fps 3/	-	-	3.4	5.0
Tailwater elevation ft msl	1021.1±	-	-	-

1/ The 100 Year Flood has one chance in 100 of occurring in any given year.
2/ The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.
3/ Critical Velocity

5.7 Reservoir Emptying Potential: An 8-inch cast iron pipe with outlet elevation 1021.1 is available for lowering the reservoir to elevation 1032.2. The low level outlet will permit a withdrawal of about 4 cfs with the reservoir level at the crest of the principal spillway and essentially dewater the reservoir in 4 days. This is equivalent to an approximate drawdown rate of 2 feet per day. This is based on the hydraulic height measured from the maximum storage pool at elevation 1040.2 to elevation 1032.2 divided by the time to dewater the reservoir.

5.8 Evaluation: Based on the size (small) and hazard classification (significant) the recommended Spillway Design Flood is the 100 Year Flood to the 1/2 PMF. Because of the risk involved, the 1/2 PMF has been selected as the SDF. The emergency spillway will pass 29 percent of the PMF or 58 percent of the SDF without overtopping the dam. The SDF will overtop the dam by a maximum 0.25 feet, reach an average critical velocity of 3.4 feet per second and flow over the dam for 1 hour.

Conclusions pertain to present day conditions. The effect of future development on the hydrology has not been considered.

SECTION 6

DAM STABILITY

6.1 Foundation and Abutments: There is no information available on the foundation conditions. The dam is located in the eastern margin of the Valley and Ridge physiographic province. The area is characterized by broad, elongated valleys separated by ridges and hills. The Rome Formation overcrops in the vicinity of the dam and is characterized by red, green, gray, purple, and buff shale and silt stone with interbedded light to dark bluish gray limestone and dolomite. Several zones of tectonic breccia occur along the Max Meadows Fault located north of the dam site. Geologic evidence indicates that the Rome Formation has been thrust northwestward by the Max Meadows Fault. The Rome Formation weathers to a reddish-brown soil containing shale chips. In areas where the carbonate beds are thick, weathering results in Karst topography.

There are no rock outcrops at the dam site. However, according to the contractor the embankment cutoff was keyed into hard shale. The left abutment was keyed into overburden. The predominate foundation materials are relatively impervious, stable, fine grained alluvial soils, and shale bedrock. There are no foundation drains.

6.2 Embankments:

6.2.1 Materials: According to the contractor the dam has a clay cutoff. The embankment consist of clay with shale fragments. Borrow material was excavated from within the reservoir area. Area soils are low plastic silty clays with some fine to medium sand.

6.2.2 Stability: According to the contractor, the dam was design and constructed under the supervision of the SCS. There are no available stability calculations. The dam is 23.9 feet high and 24 feet wide. The upstream slope above the waterline is 2H:1V. The submerged slope is estimated to be 2.74:1V. The downstream slope is 3.5H:1V. The dam is subject to a sudden drawdown because the approximate reservoir drawdown rate of 2 feet per day exceeds the critical rate of 0.5 feet per day for earth dams. The dam has experienced a sudden drawdown. According to the owners, the dam is periodically drawndown 8 feet in one week or 1.1 feet per day. This exceeds the critical rate and the submerged slope has experienced no side effects. The existing pool is about 0.4 feet below normal pool elevation. The dam has experienced the maximum control storage pool which is at the elevation emergency spillway (3 feet above normal pool) with no apparent side effects.

According to the guidelines presented in the Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation for small homogenous dams, with a stable foundation, subjected to a drawdown and composed of a low plastic fines (CL, ML). The recommended slopes are 3.5H:1V upstream and 2.5H:1V downstream. The recommended width is 14 feet. Based on these guidelines, the width and downstream slope are adequate but the upstream slope is inadequate. Also, the visual inspection revealed a shallow slough on the upstream slope above the waterline.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: There is insufficient information to adequately evaluate the stability of the dam. The visual inspection revealed a shallow slough on the upstream slope above the waterline. Based on the Bureau of Reclamation guidelines, the upstream slope is inadequate, but the width is more than adequate. However, the dam was designed and constructed under the supervision of the SCS. The upstream slope is inadequate but has experienced periodic sudden drawdowns with no apparent side effects on the submerged slope. Also, the width is excessive and can probably withstand an upstream slope failure without breaching the crest. The slough is shallow in nature and there is no real explanation for its existence. Overtopping is not a problem because flows are shallow, last 1.0 hours, and the velocity is less than 6 fps, the effective eroding velocity for a vegetated earth embankment.

A stability analysis is not required because the width and downstream slope are adequate. The upstream slope is inadequate but has periodically experienced sudden drawdowns without apparent side effects. The shallow slough is unexplained but will be monitored for further development as part of a regular maintenance program. Also the dam was reportedly designed and constructed under the supervision of the SCS.

SECTION 7

ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The available engineering data is insufficient to evaluate the embankment stability. The visual inspection revealed no findings that proved the dam to be unsound. The dam is maintained by the local homeowners association. However, there is no regular maintenance operations program or emergency operations and warning plan. Overall the dam is in good condition and there is no immediate need for remedial measures. Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 1/2 PMF. The spillways will pass 29 percent of the PMF or 58 percent of the SDF without overtopping the crest of the dam. Flows overtopping the dam during the SDF are not considered detrimental to the embankment. The combined capacity of the spillways is adjudged inadequate but not seriously inadequate. A stability check of the dam is not required.

7.2 Recommended Remedial Measures: It is recommended that the regular maintenance operation program be instituted and documented for future reference. A formal emergency procedure should be prepared and furnished to all operating personnel. This should include how to operate the dam during an emergency, and who to notify including public officials, in case evacuation from the downstream area is necessary. Also, the inspection revealed the following maintenance items that should be scheduled by the owner during a regular maintenance period within the next 12 months:

a. The slough on the upstream slope and the wet spot just left of the principal spillway outlet should be monitored. If the slough enlarges, and/or erosion develops along the outlet pipe, the reservoir should be immediately drawn down and a professional geotechnical engineering firm should be contacted for further evaluation.

b. All shrubs and trees up to 3 inches in diameter should be cut to the ground. Trees greater than 3 inches should have there root systems removed. Subsequent holes should be backfilled with compacted material and seeded.

c. The shrubs that block the entrance to the three 36-inch CMP should be cut to the ground. The berm that blocks the discharge invert of the three CMP should be cut down to below the invert.

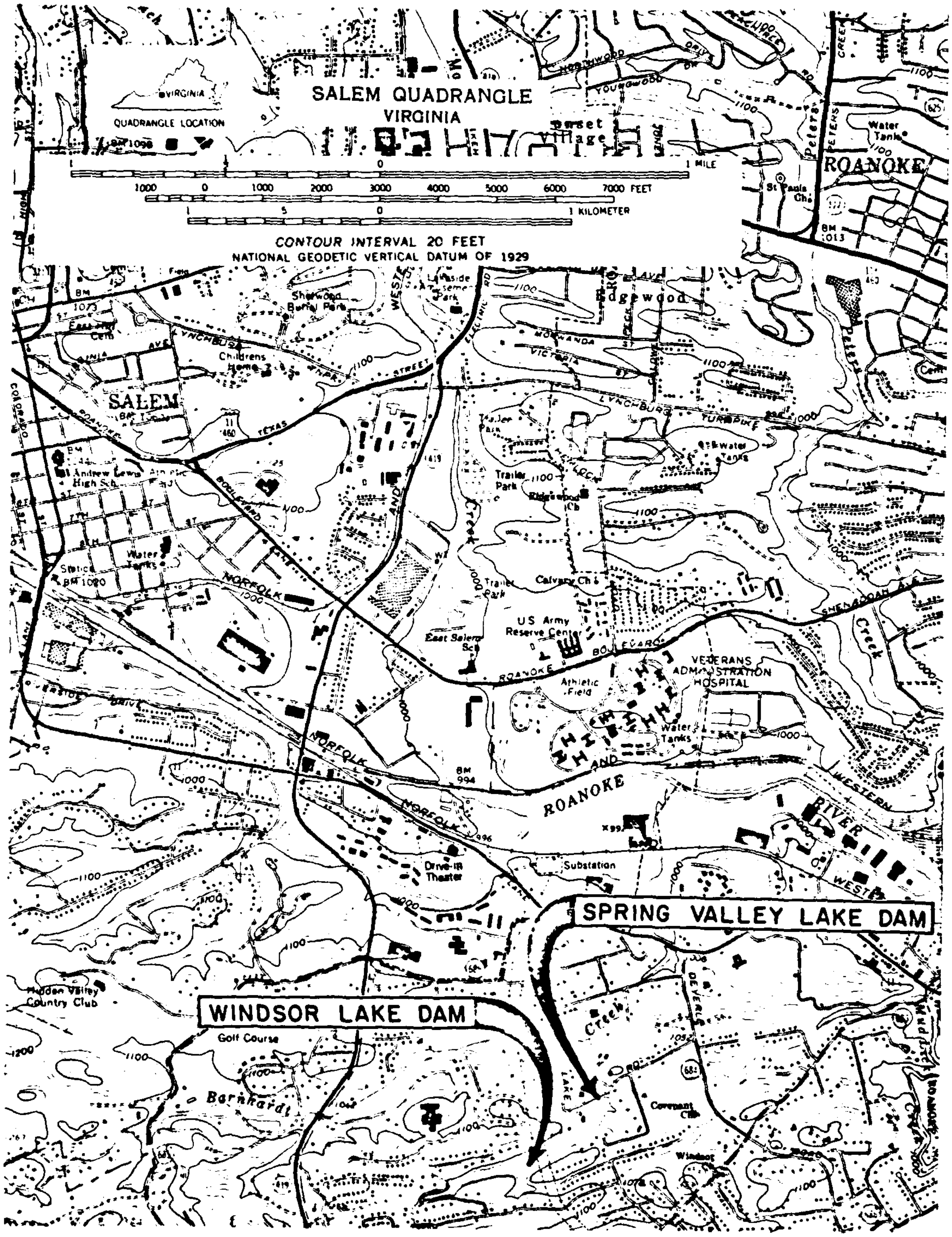
d. The sparsely vegetated downstream slope should be reseeded and animals prevented from grazing on it to protect the growth on the slope.

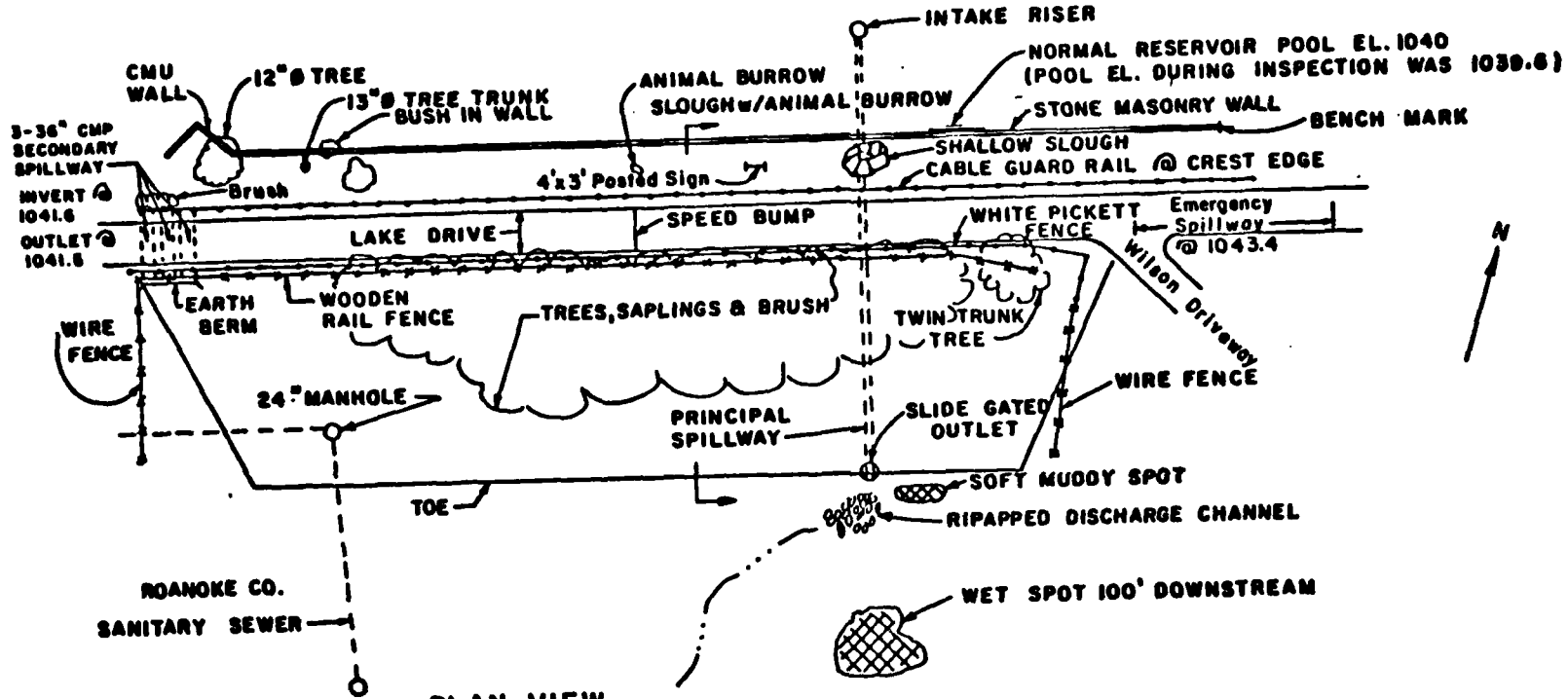
e. The animal burrows on the upstream slope should be backfilled and seeded.

f. A staffgage should be placed in the reservoir area to visually monitor pool elevations.

APPENDIX I

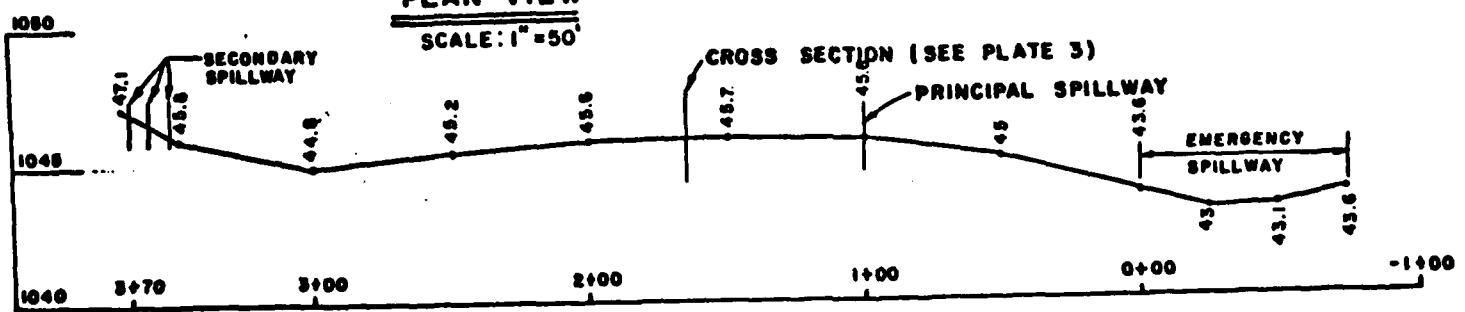
MAPS AND DRAWINGS


SALEM QUADRANGLE
VIRGINIA
VIRGINIA
QUADRANGLE LOCATION
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ROANOKE
SALEM
Edgewood
LYNCHBURG TURNPIKE
Childrens Home
Andrew Lewis High Sch
Water Tanks
Trailer Park
Calvary Ch
US Army Reserve Center
East Salem Sch
VETERANS ADMINISTRATION HOSPITAL
Athletic Field
NORFOLK
AND
WESTERN
ROANOKE
RIVER
Substation
Drive-in Theater
SPRING VALLEY LAKE DAM
WINDSOR LAKE DAM
Hidden Valley Country Club
Golf Course
Barnhardt
Creek
Covenant Ch



PLAN VIEW

SCALE: 1" = 50'



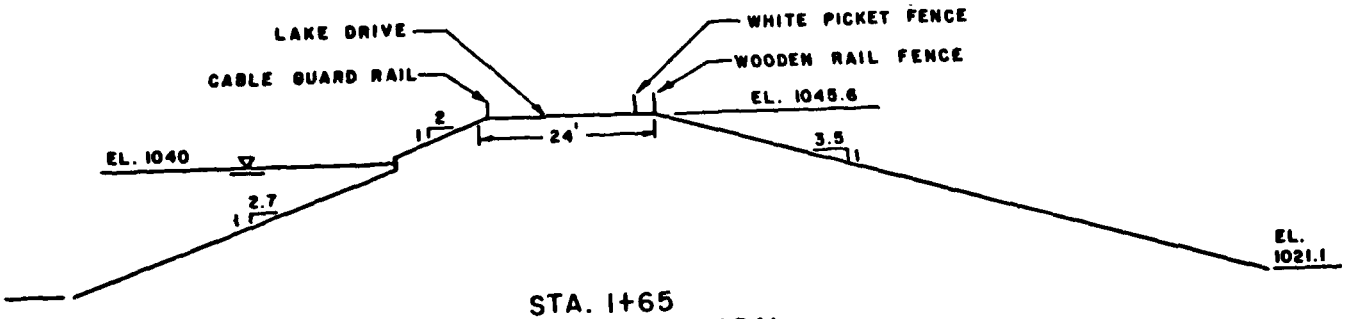
CREST PROFILE

SCALE: H 1" = 50'
V 1" = 5'

NOTE: SURVEY DATA TAKEN DURING INSPECTION WAS CORRELATED TO THE SALEM, VIRGINIA QUADRANGLE MAP (1040 FT. MSL NORMAL POOL)

SPRING VALLEY LAKE
CITY OF ROANOKE, VA.

PLATE II



STA. 1+65

CROSS SECTION

SPRING VALLEY LAKE

CITY OF ROANOKE, VA.

13 NOV. 80

SCALE: 1"=50'

NOTE: THE SUBMERGED UPSTREAM SLOPE WAS REPORTED TO BE 2H:1V. THE INTAKE STRUCTURE WAS LOCATED BY TRIANGULATION. IT IS REPORTED THE INTAKE STRUCTURE IS AT TOE AT A WATER DEPTH OF 18 FEET. USING THIS INFORMATION IT WAS GRAPHICALLY DETERMINED THE SUBMERGED SLOPE IS MORE LIKE 2.7 H:1V.

PLATE III

APPENDIX II

PHOTOGRAPHS

PHOTO #1 CREST OF DAM

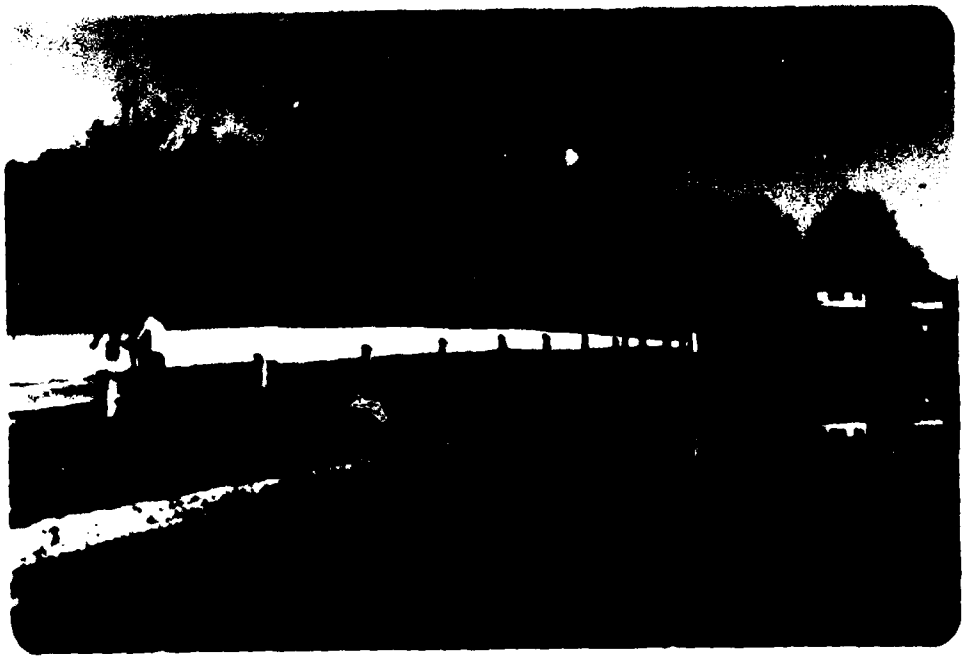


PHOTO #2 UPSTREAM FACE OF DAM

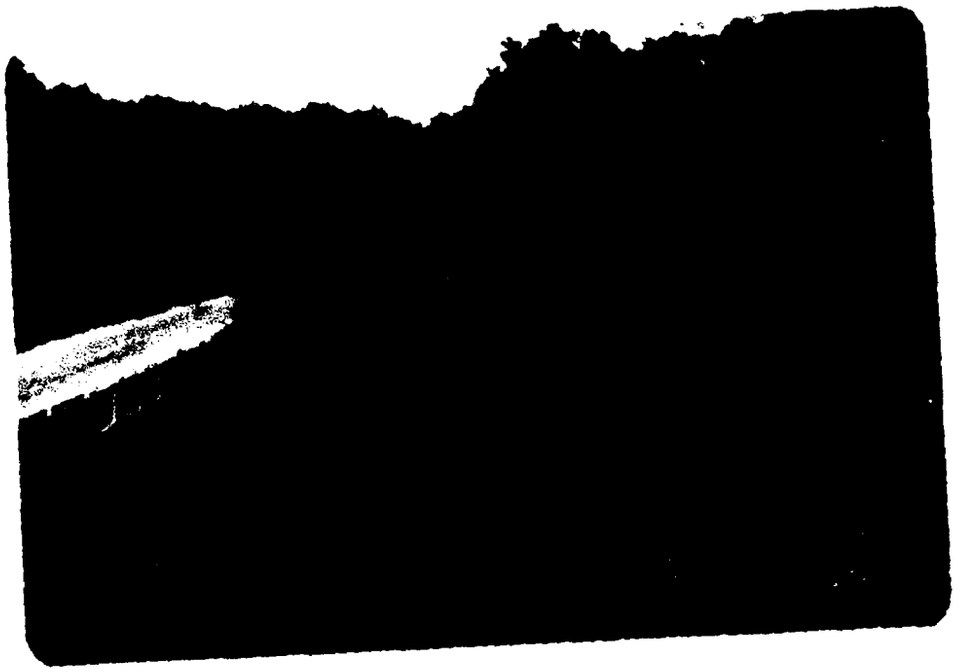


PHOTO #3 DOWNSTREAM FACE

PHOTO #4 DOWNSTREAM FACE & CONTACT LT. ABUTMENT AND EMBANKMENT

PHOTO #5 RESERVOIR DRAIN OUTLET

PHOTO #6 DISCHARGE CHANNEL / DOWNSTREAM

APPENDIX III

FIELD OBSERVATIONS

Check List
Visual Inspection
Phase I

Name Dam: Spring Valley Lake County: City of Roanoke State: Virginia Coordinates: Lat. 3715.4 Long. 8001.2

Date of Inspection: 13 Nov 80 Weather: Clear, Cool Temperature: 50°-55° F

Pool Elevation at Time of Inspection: 1039.6 ft msl Tailwater at Time of Inspection: None

Inspection Personnel:
D. Pezza, COE
J. Robinson, COE
J. Miller, COE
B. Taran, COE
L. Jones, COE
D. Bushman, SWCB
H. Gildea, SWCB
R. T. Main, Homeowners Assoc.
Mr. Stockton, Homeowners Assoc.
Mrs. Wilson, President, Homeowners, Assoc.

Pezza and Robinson Recorders

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	No surface cracks were observed. Ground conditions are dry. Area soils are low plastic silty clays with some fine to medium sand.	None
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No movement or cracking was observed at the toe.	None
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	There is a shallow slough on the upstream slope at STA 1+00, in line with the principal spillway. The slough is old and vegetated. It is 17 feet wide. It extends from 1 foot below crest to top of retaining wall. The wall shows no signs of movement. There is a 4-inch diameter, 11-inch deep animal burrow in the center of the slough. A second burrow exist on the upstream slope at STA 1+85.	There is no apparent explanation for slough. There is concern because its in line with the spillway. Post Inspection Note: The reservoir was drawn down right after the official inspection. On 30 Nov 80, the exposed upstream slope was casually observed for further sloughing. There were no signs of additional sloughing. The animal burrows should be backfilled and seeded.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	There are no signs of vertical or horizontal movement of the embankment. The crest of the dam serves as a private road. It is paved with bituminous asphalt.	None

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RIPRAP FAILURES	Their is no riprap on the embankment. The upstream slope is protected with a 2 foot high, 9-inch wide stone masonry retaining wall. The wall showed no signs of movement. The discharge channel is randomly and highly ripraped with concrete rubble.	None
FOUNDATION	There are no rock outcrops in the area. It was reported by contractor that the embankment cutoff was keyed. On the right abutment, the cutoff was keyed into land shale. The left side was keyed into overburden.	None
ANY NOTICEABLE SEEPAGE	There is no seepage. There is a large soft muddy spot located just left of the gated outlet. There is a large wet spot about 100 feet downstream of the toe. There are no signs of the source of the wet spot. The owner suspects the water comes from sanitary drainfield. The owner knows there is one nearby, but does not know exactly where.	The large soft muddy spot in conjunction with the slough in line with the principal spillways needs further evaluation.
DRAINS	It was reported by the contractor that no drains were installed. A portion of the principal spillway pipe was laid in a gravel bed. The contractor could not recall specific details. The gravel was probably plowed under the pipe downstream of toe cutoff.	None

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MATERIALS	It was reported by the contractor that the embankment was constructed with a clay cutoff keyed into the foundation. Borrow material came from the reservoir area. The material was a clay-shale.	None
VEGETATION	The upstream slope is covered with trimmed grass. Also there are three trees and some brush as located on Plate II, Appendix I. The downstream slope is sparsely vegetated with grass. Portions of the slope are vegetated with bushes, saplings and trees. The immediate downstream area is a horse farm and the animals graze on the downstream slope.	All shrubs, saplings, and trees up to 3 inches in diameter should be cut to the ground. Trees greater than 3 inches should be backfilled with compacted material and seeded. The downstream slope should be reseeded and animals prevented from grazing on it to protect the slope.

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	The principal spillway is an 8-inch cast iron drop-inlet pipe located about 40 feet upstream of the retaining wall on the upstream face of the dam. A 12-inch cover with trash rack rests on top of the 8-inch CIP. It was impossible to obtain elevation from the shoreline.	None
OUTLET WORKS	The 8-inch CIP passes through the embankment to low level outlet at the downstream toe of the dam. A screw gate valve is located at the outlet. The valve can be closed to allow a pressure change in the pipe to drain the reservoir. The valve is kept open.	None
EMERGENCY GATE	The reservoir can be lowered 8 feet by pulling a copper cable attached to the drop-inlet near normal pool. First the 8-inch valve on the downstream face of the dam must be closed to equalize pressure so that the cable can be pulled to open the outlet. Once pressure equalizes the 8-inch valve can be opened to allow flow.	None

SECONDARY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTION	Three 36-inch CMP pass through the dam at the right abutment. An earth berm partially blocks the discharge end of the outlet. There is no protection for the embankment should flow pass through the spillway.	The outlets should flow freely down the abutment. Remove the earth to the invert of the discharge end of the pipe.
APPROACH CHANNEL	The entrance to the 3 CMP is blocked by shrubs. The area between the shrubs and the reservoir is nicely grassed and in good condition.	The shrubs should be removed to allow ease of flow.
DISCHARGE CHANNEL	Besides the earth that blocks the discharge outlet there is no obstruction down the abutment.	None.

EMERGENCY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTION	A low point in the road at the left abutment is called the emergency spillway. The control section is paved and has received flows at least once.	None
APPROACH CHANNEL	The approach channel is grassed with a mild slope.	None
DISCHARGE CHANNEL	The discharge channel is grassed with a steep slope along the left abutment. There is no protection for the embankment should flow pass through the spillway.	None.

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATION
MONUMENTATION/SURVEYS	There are no survey monumentation.	None
OBSERVATION WELLS	There are no wells.	None
WEIRS	There are no weirs.	None
PIEZOMETERS	There are no piezometers.	None
STAFFGAGES	There are no staffgages.	A staffgage should be placed in the reservoir area to visually monitor pool elevations.
OTHER	There are no other types of instrumentation.	None.

RESERVOIR

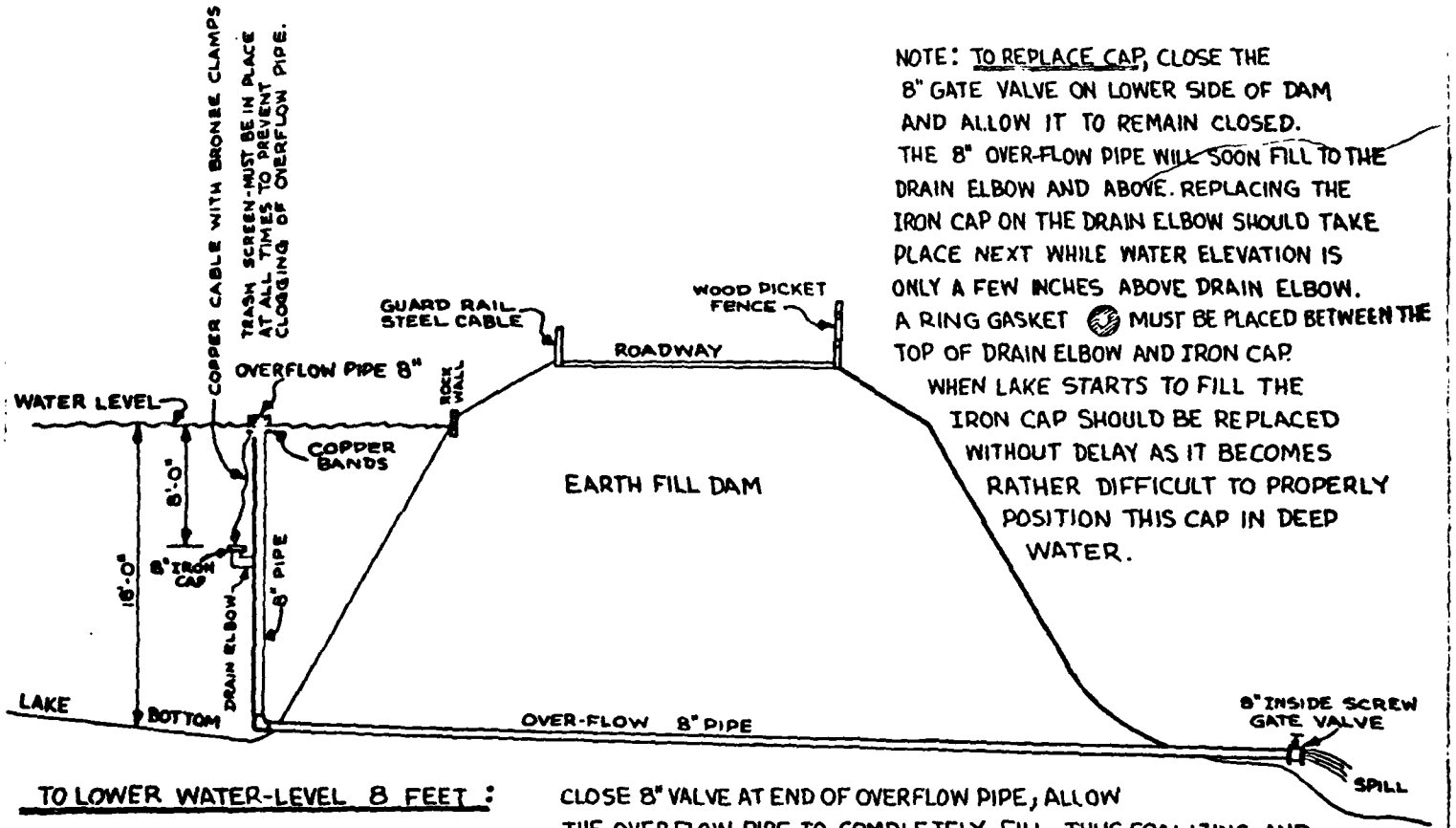
VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Residential homes surround the reservoir area. The slopes are mild and well manicured. Boat docks and retaining walls could be observed around most of the reservoir. There are no signs of erosion or slope failures.	None.
SEDIMENTATION	The lake was partially dredged about 20 years ago and little sedimentation was removed. The inspection team was unable to evaluate.	None.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is shallow and narrow with a wide, flat flood plain. No obstructions were observed until a property fence crossed the area about 200 yards downstream. Beyond the fence is a much wider, flat flood plain.	None.
SLOPES	The flood plain is flat with steep side slopes covered with trees.	None.
APPROXIMATE NO. OF HOMES AND POPULATION	Several homes are located in the downstream flood plain.	These homes could receive some damage due to flooding during a dam failure.

APPENDIX IV

OPERATION OF OUTLET



NOTE: TO REPLACE CAP, CLOSE THE 8" GATE VALVE ON LOWER SIDE OF DAM AND ALLOW IT TO REMAIN CLOSED. THE 8" OVER-FLOW PIPE WILL SOON FILL TO THE DRAIN ELBOW AND ABOVE. REPLACING THE IRON CAP ON THE DRAIN ELBOW SHOULD TAKE PLACE NEXT WHILE WATER ELEVATION IS ONLY A FEW INCHES ABOVE DRAIN ELBOW. A RING GASKET MUST BE PLACED BETWEEN THE TOP OF DRAIN ELBOW AND IRON CAP. WHEN LAKE STARTS TO FILL THE IRON CAP SHOULD BE REPLACED WITHOUT DELAY AS IT BECOMES RATHER DIFFICULT TO PROPERLY POSITION THIS CAP IN DEEP WATER.

TO LOWER WATER-LEVEL 8 FEET: CLOSE 8" VALVE AT END OF OVERFLOW PIPE, ALLOW THE OVERFLOW PIPE TO COMPLETELY FILL, THUS EQALIZING, AND RELIEVING PRESSURE ON 8" IRON CAP WHICH CAN THEN BE EASILY REMOVED BY PULLING UP ON COPPER CABLE.

WARNING - THE HYDRAULIC PRESSURE CALCULATES TO 130 POUNDS ON THE 8" CAP, DURING NORMAL OVERFLOW CONDITIONS WITH 8" VALVE OPEN. DO NOT ATTEMPT TO LIFT CAP WITH VALVE OPEN AS IT REQUIRES OVER 130 POUNDS PULL STRAIGHT UP. SUCTION COULD PULL A DIVER AGAINST PIPE AND DROWNING RESULT.

EOS 10/15/18

APPENDIX V

REFERENCES

APPENDIX V

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Office of the Chief of Engineers, Department of the Army, Washington, D. C.

2. HEC-1DB Flood Hydrograph Package, (Hydrologic Engineering Center, U. S. Army Corps of Engineers, September 1978.)

3. "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Hydrometeorological Report No. 51, (U. S. Weather Bureau, June 1978).

4. "Rainfall Frequency Atlas of the Unites States", Technical Paper No. 40, (U.S. Weather Bureau, May 1961).

5. Geology of Salem Quadrangle, Virginia, by R. V. Amato, Virginia Division of Mineral Resources, 1974.


DAT
FILM